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## **Multinational Firms and Job Tasks**

Katariina Nilsson Hakkala, Fredrik Heyman and  
Fredrik Sjöholm

# MULTINATIONAL FIRMS AND JOB TASKS

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## Abstract

We analyze the impact of multinational and foreign ownership on the demand for job tasks and educational skills. By using Swedish matched employer-employee data, we find that both foreign and domestic multinational firms have high shares of non-routine tasks and tasks requiring personal interaction. Moreover, acquisitions of local firms by multinationals increase the relative demand for non-routine and interactive job tasks in the targeted firms. The differences in the demand for job tasks are only partly explained by firm characteristics. Dividing employees by education instead of job tasks does not result in the same effects on relative labor demand, which shows that task measures do indeed capture a new labor market aspect.

**JEL:** J23, F16, F21, F23

**Keywords:** FDI, Cross-Border Acquisitions, Multinational enterprises, Foreign Ownership, Job Tasks, Labor Demand, Skill Groups.

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## **I. Introduction**

The influence of multinational enterprises (MNEs) has unsettled policymakers worldwide. Some argue that MNEs are more inclined than local firms to offshore jobs and downsize inefficient plants – or even shut them down entirely. Indeed, these fears are not baseless; MNEs enjoy opportunities to restructure production to capitalize on location advantages throughout the world.

In developed countries - where multinational firms locate knowledge intensive production while offshoring low-skilled jobs elsewhere – unskilled workers are generally believed to be threatened. Yet studies on foreign direct investment (FDI) find small if any effects of outward investments on home country demand for white- and blue-collar workers (Slaughter, 2007; Head and Ries, 2002). On a related issue, acquisitions of local firms by foreign multinationals have little impact on the relative demand for different employees (e.g. Almeida, 2003; and Huttunen, 2007).

The lack of empirical support may stem from previous studies' focus on the demand for low- and high-skilled labor, often defined in terms of education. Recent literature emphasizes that international trade increasingly entails exchanges of bits of value added by different job tasks in different locations, rather than finished or even intermediate goods (e.g. Jones and Kierzkowski, 2001; Grossman and Rossi-Hansberg, 2008a and 2008b). Several authors put forward that whether job tasks are located away from headquarters and main production facilities depends on characteristics other than skill intensity (e.g. Markusen, 2006; Blinder, 2006).

In particular, routine tasks and tasks that do not require personal interaction can more easily be offshored. MNEs may thus relocate skill-intensive tasks if they fall within this category. On the other hand, some tasks carried out by low-skilled workers require proximity to other parts of the production and are not easily offshored.

Shifting the focus from skills to job tasks may allow us to discover unknown effects of increased inward FDI on domestic employment.

We revisit the question how inward FDI and multinational ownership affect relative labor demand. In line with recent literature, we define the division of labor in terms of job tasks. The underlying assumption is simple: we expect multinational firms with global production networks to have a better “offshoring technology” and lower offshoring costs than non-multinational firms. Inward FDI, or acquisitions of non-multinationals by multinationals, could then trigger a restructuring leading a more efficient division of labor and changes in the demand for workers as the global production networks of the acquirers become available for the acquired non-multinational firms. More specifically, we would expect to see decreasing demand for workers engaged in activities and job tasks that can be more easily offshored from the non-multinational target firms.

We use comprehensive Swedish matched employer-employee data for the period 1996 to 2005. The data include all Swedish firms with at least 20 employees and we have detailed information on occupations for a representative sample of roughly 50 percent of the labor force.

We contribute to the literature in several respects. First, we show that MNEs - both Swedish and foreign-owned - have a higher share of employees doing non-routine tasks or tasks requiring personal interaction than local firms. We proceed to analyze the effect of different types of acquisitions on relative demand for job tasks, and address causality issues by using a propensity score matching method. Our results show that acquisitions of local firms by multinational firms increase the share of employees doing non-routine tasks or tasks requiring personal interaction. Firm characteristics such as offshoring and size explain part of the differences in relative

demand for job tasks. Using a distinction of the labor force according to educational attainment – the standard measure in previous studies – does not indicate any effects of acquisitions on the skill composition of firms. This suggests that using job task measures instead of educational skill measures do indeed capture a new labor market aspect.

The rest of the paper is organized as follows. In the next section, we discuss the background to this paper and related empirical literature, section III describes the empirical approach, section IV presents the data and show descriptive statistics, V presents the results and VI concludes the paper.

## **II. Background and Related Empirical Literature**

The multinational firm is believed to be a key actor in international division of job tasks (Grossman and Rossi-Hansberg, 2008b). Falling transport costs, improvements in information and communication technologies, and liberalized FDI regimes have decreased offshoring costs and enabled firms to form increasingly sophisticated global production networks. Jones and Kierzkowski (2001) and Grossman and Rossi-Hansberg (2008a; 2008b) note that current trade increasingly entails the exchange of small parts of products and processes that involve different job tasks in different locations, rather than finished goods or even complete intermediate goods. As a result, a very high share of international trade today takes place within MNEs. For instance, Grossman and Rossi-Hansberg (2007, p.67) show that about 47 percent of US imports are conducted within multinational firms in 2005.

With their international production networks and experience of running operations in different countries, MNEs are apt to react and adjust their operations to differences in production costs across countries. Multinational firms should therefore

have more specialized production and job tasks as compared to local firms. The decision to keep job tasks close to headquarters rests on cost considerations but also the possibility to offshore them.

Several authors argue that characteristics other than skill intensity (level of education) explain the ability to offshore job tasks, i.e. locate them away from headquarters and main production facilities. For instance, it has been argued that offshorable tasks can be summarized in deductive rules (Levy and Murmane, 2004); that they are defined by codifiable rather than tacit information (Leamer and Storper, 2001); and that physical contact or proximity are not required (Blinder, 2006). Such job tasks are often carried out by unskilled labor, but this is not requisite. Computer programming and x-ray analysis are well-known examples of job tasks that require education at post-secondary level, but that can be easily offshored nonetheless. Many Indian radiologists and computer engineers who perform job tasks for US and European firms witness to this effect. On the other hand, maintenance and cleaning work exemplify job tasks that rely on unskilled labor that cannot be carried out from a distance.

Autor et al. (2003) develop a framework to study how the use of computers has affected relative demand for job tasks. They classify job tasks into five different categories: non-routine analytical, routine cognitive, non-routine interactive, routine manual, and non-routine manual. Routine tasks can be expressed as rules, making them easy to program and thus suitable for execution by computers or robots. Yet non-routine tasks cannot be easily codified and performed by computers. Autor et al. show that shares of non-routine analytical and non-routine interactive tasks in the US increased from 1960 to 1998.

This paper focuses on acquisitions' effect on relative demand for different tasks. Theories of ownership change emphasize that a takeover is often seen as an opportunity to restructure the operations of the target firm (Shleifer and Summers, 1988; and Bertrand and Mullainathan, 2003) and an effective way of reducing of administrative and managerial employment (see e.g. Shleifer and Vishny, 1988; and Lichtenberg and Siegel, 1990). When the acquirer is a multinational firm, the takeover may also trigger the offshoring of parts of production to benefit from international production networks and reduce costs.

Studies on foreign acquisitions and relative demand for different skill groups are scarce and results are ambiguous. Lipsey and Sjöholm (2008) examine how foreign acquisitions of Indonesian firms affect employment of white- and blue-collar workers; they find that foreign takeovers increase the number of blue-collar workers and have no or even a negative effect on white-collar workers. Slaughter (2000) and Head and Ries (2002) discover small if any effects of outward FDI on home country demand for blue- and white-collar workers.

Two other studies use education as a measure of skill instead. Almeida (2007) finds that foreign acquisitions of Portuguese establishments do not affect the educational composition of workers, whereas Huttunen (2007) documents a marginal decrease in share of workers with higher education after foreign acquisitions of Finnish establishments. These results suggest that effects of acquisitions on relative labor demand are either small or insignificant when defining skills by education.

Becker et al. (2008) is the only study that defines the composition of labor force in terms of job tasks. They use a panel of 490 German MNEs from 1998-2002 to examine how foreign employment affects demand for job tasks in the home country.



They find that the proportion of home country non-routine and interactive tasks increases with employment in foreign affiliates, especially in the service sector.

### III. Econometric Approach

In line with previous studies on relative labor demand, we estimate the following reduced-form translog cost function:

$$\psi_{ijt} = \alpha_0 + \alpha_1 \log(k)_{jt} + \alpha_2 \log(Y)_{jt} + \alpha_3 Z_{jt} + \alpha_4 (\text{owner})_{jt} + \alpha_5 \log(w_i / \bar{w}_{-i})_{jt} + d_j + d_t + \varepsilon_{it} \quad (1)$$

where  $\psi_{ijt}$  is the wage cost share of task  $i$  in firm  $j$  at time  $t$ ,  $k_{jt}$  is the capital-output ratio,  $Y_{jt}$  is output,  $Z_{jt}$  a variable capturing factor-biased technical change and  $(w_i / \bar{w}_{-i})_{jt}$  is the average wage of employees carrying out task  $i$  in firm  $j$  relative to the average wage of other employees.<sup>1</sup>

Our measure on the cost share for a particular type of job tasks is constructed by multiplying the wages in different occupations with the share of the job tasks in that occupation and then aggregate the wage cost shares for task  $i$  to the firm level. We also use the traditional measure of skills defined as costs shares based on employees' level of education, which allows us to compare our results to previous studies and to conclude whether the use of job tasks contribute to our understanding of FDI and relative labor demand.<sup>2</sup>

We use real value added for  $Y_{jt}$  and  $Z_{jt}$  is proxied by a sector level measure on ICT capital defined as capital compensation for computing and communications

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<sup>1</sup> This is a standard model in related literature (see e.g. Slaughter, 2000; Head and Ries, 2002; Hansson, 2005; and Becker et al., 2007). Note that the relative wage term in equation (1) may give rise to a potential endogeneity bias because wages and employment are jointly determined and because wages also enter the dependent variable. We follow the praxis of previous studies and omit this variable.

<sup>2</sup> See Table A1 in the appendix for construction of the variables.

equipment as a share in total capital compensation.<sup>3</sup> The sign of  $\alpha_1$  shows if capital substitutes for or complements task  $i$ , and the sign of  $\alpha_3$  depends on whether technical change is biased towards or away from the usage of labor carrying out task  $i$ .  $d_j$ ,  $d_t$ , and  $\varepsilon_{it}$  are firm-specific time invariant effects, time-specific effects and an i.i.d. error term, respectively. To allow for within firm correlation over time, standard errors are adjusted for clustering at the firm level.

*Owner* equals one if a firm is foreign-owned, and zero otherwise, or when we compare multinationals to non-multinationals firms, it equals one if the firm is a multinational. When we examine ownership changes, *Owner* takes the value of one when an ownership change is recorded and thereafter.

In the first estimations, we examine the relative demand for job tasks in domestic versus multinational (foreign) firms in a sample of firms that remain in the same ownership over the entire period. Firms changing ownership are excluded.<sup>4</sup> We divide our sample into three groups: foreign-owned MNEs; domestically-owned MNEs; and domestically-owned non-MNEs (which we also refer to as local firms). A firm is classified as foreign-owned MNE if more than 50 percent of the equity is foreign-owned.<sup>5</sup> We define a domestically-owned MNE as a firm reporting positive exports to other firms within the corporation. Finally, firms reporting no such exports are classified as domestically-owned non-MNEs.<sup>6</sup>

In the second approach, we analyze the effect of an ownership change. All firms except those that experience multiple ownership changes are included in the

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<sup>3</sup> We also use R&D to sales as a proxy for SBTC as a robustness check.

<sup>4</sup> In these regressions we include industry-specific effects but no firm-specific effects.

<sup>5</sup> Statistics Sweden uses the internationally common 50 percent cut-off in defining foreign ownership. Other studies on FDI do typically not find lower cut-off values to matter for the results (see e.g. Huttunen, 2007; Martins, 2004; and Barbosa and Louri, 2002).

<sup>6</sup> Information on export is available for firms with at least 50 employees and for smaller firms with large sales. A few small multinationals might be classified as local firms because of missing information on exports. We therefore re-run our estimations below on firms with above 50 employees, which does not affect the results.

estimations. We include firm-specific effects, and also time dummies to control for changes in the relative task demand that are common to all firms. Three different types of acquisitions are examined: from a Swedish local to a MNE, from a Swedish local to a foreign MNE, and from a Swedish MNE to a foreign MNE.<sup>7</sup> The first two allow us to distinguish between effects of foreign ownership and multinational ownership in general. The last allows us to examine if there is an effect on labor demand even in acquired firms that are already multinational. Foreign firms acquire an average of 49 firms annually: 30 MNEs and 19 local firms.

The estimated effect of acquisitions may suffer from a potential endogeneity problem if the target firms differ systematically from non-acquired firms. We use propensity score matching to control for this endogeneity (see e.g. Rosenbaum and Rubin, 1983). This approach reduces the bias from differences in firm characteristics by comparing the outcomes for similar treated and non-treated observations, based on the pre-treatment characteristics. The matching is based on observable firm characteristics and uses the algorithms provided by Becker and Ichino (2002) and Leuven and Sianesi (2003). We use the Nearest-Neighbor without replacement method.

More specifically, we first calculate the probability that a firm is acquired for each of our three different changes in ownership. Each treated (acquired) firm is then matched with a non-treated (non-acquired) firm that is as similar as possible. We test and make sure that the matching satisfies the balancing property of the propensity

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<sup>7</sup> The data on Swedish local firms acquired by a MNE consist of firms that are either local during the entire period or being acquired by a MNE at some time during the period. The same structure applies to the other two forms of takeovers.

score.<sup>8</sup> We proceed to estimate the impact of different types of acquisitions on the relative demand for job tasks on the matched sample of firms.

As discussed in Section II, a potential determinant to relative demand for job tasks is the ability to engage in offshoring. We analyze the role of offshoring by adding a firm-level proxy of offshoring, defined as the share of imported intermediate goods in total sales.<sup>9</sup> This measure proxies offshoring to the extent as increases in the share of imported intermediate goods are substituting domestic production. We differentiate between offshoring activities to low- and high-income countries. Offshoring to high-income countries (OECD countries) is roughly ten times higher than offshoring to low-income countries (non-OECD countries). In addition to offshoring, we examine if other firm characteristics, such as size, human capital, profits, firm age and export intensity can explain firm-level differences in the demand for job tasks.

Finally, we estimate alternative specifications to further examine the robustness of our results. Most importantly, we will use alternative definitions of job tasks and alternative dependent variables. A description of the included variables is presented in Table A1 in the appendix.

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<sup>8</sup> The test for balancing property examines treated and non-treated observations in different sub-samples (blocks) of observations. The number of blocks is determined by data and the estimated score. Within these intervals, the algorithm tests that the means of the covariates in the probit do not differ between treated and non-treated observations. In testing the balancing property, only observations in the region of common support are included.

<sup>9</sup> This is a common way to measure offshoring in related literature (see e.g. Ekholm and Hakkala, 2005). As a robustness check, we also make use of a broader measure of offshoring which includes also imports of consumption goods.

## IV. Data and Descriptive Statistics

### *Swedish Employer-Employee Data*

We use register-based matched employer-employee data set from Statistics Sweden covering the period 1996-2005. To ensure that our sample remains consistent over time, we restrict our analysis to firms with at least 20 employees. The financial statistics contain detailed firm-level information on all Swedish firms. Variables such as value added, capital stock (book value), number of employees, wages, ownership status, sales, and industry are included. Moreover, regional labor market statistics contribute information on education and demographics at the plant level, which we aggregate to the firm level. The individual wage statistics database contains information on the full-time equivalent wages, education, job types, and gender of approximately 2 million individuals per year, roughly 50 percent of the Swedish labor force.

Data on offshoring comes from Swedish Foreign Trade Statistics, collected by Statistics Sweden and available at the firm level and by country of origin for the period 1997-2005. Stemming from compulsory registration in Swedish Customs, data on imports from outside the EU consist of all trade transactions. Trade data for EU countries are available for all firms with a yearly import above 1.5 million SEK. According to figures from Statistics Sweden, the data incorporates 97 percent of total trade with EU countries; however, the number of observations is smaller when the offshoring variable is included.<sup>10</sup>

All data sets are linked together with unique identification numbers. The total number of observations on firms that do not change ownership equals 28,646. The corresponding figures for our three different acquisition samples are 17,832 for

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<sup>10</sup> To take this into account, we also re-estimate our regressions on firms that are included in the trade statistics (around 60% of all firm-year observations).

Swedish local firms to MNEs, 2,287 Swedish MNEs to foreign owned, and 17,086 Swedish local firms to foreign owned.

### *Measures of Job Tasks*

In line with Autor et al. (2003) and Spitz-Oener (2006), we classify occupations according to the intensity of routine and non-routine tasks. In addition, we classify occupations according to the intensity of tasks that require interaction between individuals. The classification of occupations derives from information from a German work survey codified by Becker et al. (2007); it can be translated to the international standard classification of occupations (ISCO-88), available in our data on individuals.<sup>11</sup>

In order to classify job tasks into non-routine and interactive, Becker et al. (2007) codify the survey answers to 81 yes/no questions that ask whether a worker uses a specific workplace tool or not.<sup>12</sup> They distinguish non-routine tasks involving non-repetitive methods from routine tasks, and interactive tasks requiring personal interaction with co-workers or third parties from non-interactive tasks.<sup>13</sup> Non-routine job tasks typically involve a lack of deductive rules and codifiable information, whereas interactive job tasks involve physical contact and geographic proximity. The measure is constructed as a share of the number of non-routine (or interactive) job

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<sup>11</sup> The measures are based on the Qualification and Career Survey for 1998/99 conducted by the German Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung BIBB) and the Research Institute of the German Federal Labor Agency (Institut für Arbeitsmarkt- und Berufsforschung IAB). See Acemoglu and Pischke (1998) and Spitz-Oener (2006) for two other studies using the same work survey.

<sup>12</sup> The workplace tools range from repair tools to machinery and diagnostic devices to computers and means of transport.

<sup>13</sup> To assess the robustness they create two measures, one based on a more restrictive interpretation of what is non-routine and interactive and another with a more liberal interpretation. For more details about the survey and the construction of measures, see Becker et al. (2007).

tasks in the total number job tasks of an occupation and normalized to an index that takes values between 0 and 100.<sup>14</sup>

Table 1 presents the shares of non-routine and interactive job tasks in different occupations at the 2-digit level of ISCO-88. There is an overlap—albeit imperfect—in the measures of non-routine tasks and tasks requiring personal interaction. The share of non-routine tasks is highest in science-based occupations and lowest in occupations in services, agriculture, mining, construction, manufacturing, and transport. Interactive tasks are highly represented in science-based occupations as well, but also in education. The share of interactive tasks is low for occupations with a low share of non-routine tasks but also in machine operating, handicraft, and some sales oriented occupations, among others.

--Table 1 about here--

Figure 1 documents the development of employment in Sweden through shares of non-routine tasks; tasks requiring personal interaction; and the share of the workforce with higher education, measured as with post-secondary education. The amount of non-routine and interactive tasks have remained remarkably stable over the period 1996-2005: about 42 percent of job tasks are non-routine, and 33 percent require personal interaction. Workers with higher education have, however, increased substantially from about 12 to 19 percent, in part because of the retirement of old workers with generally low levels of education and the entrance of younger, more educated cohorts of employees.

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<sup>14</sup> The task measures are normalised by the following formula:  $x_{norm_i} = [x_i - \min(x_i)] / [\max(x_i) - \min(x_i)] * 100$  where  $x_i$  is the original task index for occupation  $i$ .

--Figure 1 about here--

--Table 2 about here--

Table 2 shows the composition of job tasks and offshoring in firms with different ownership.<sup>15</sup> Standard deviations are large which means that the differences between ownership are not statistically significant. Bearing this in mind, multinational firms—both Swedish and foreign-owned—have higher shares of non-routine tasks and tasks that require personal interaction than Swedish local firms. In terms of non-routine tasks, the differences are rather large, about seven percentage points (0.48-0.41). The differences between shares of interactive tasks and of higher education are smaller than the difference in non-routine tasks. Finally, the difference between Swedish and foreign MNEs is very small for all different measures, suggesting that the relevant distinction occurs between multinational and non-multinational firms rather than between domestic and foreign firms.

The use of imported intermediate inputs offers one possible explanation for the differences in job tasks between firms. Table 2 supports this reasoning—multinational firms use imported intermediate inputs more often than local firms, and foreign multinational firms use imported intermediate outputs more often than Swedish multinational firms.

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<sup>15</sup> Job tasks and education are expressed as wage cost shares to make figures consistent with the econometric analysis. Using employment shares yields very similar differences but the levels are typically about 2 percentage points lower.



## **V. Results**

### *Examining a possible link between ownership and job tasks*

Composed of a sample of firms that retain the same owner during the sample period, Table 3 examines education and job tasks in foreign versus domestic firms and in multinational versus non-multinational firms. Our first estimation shows that foreign firms have on average about 3.7 percentage points more non-routine tasks than domestic firms, even after controlling for industry and time effects. Differences in firm characteristics can partly explain the high share of non-routine tasks; the inclusion of firm characteristics in column two reduces the foreign dummy variable, but the difference is still 2.4 percentage points and thus statistically significant.

The group of comparisons in columns one to six includes domestic local firms and domestic MNEs. Estimations in columns seven to twelve distinguish instead between local firms and domestic and foreign MNEs. A difference in the task composition between different firms arises again: multinational firms have between 2.6 and 4.3 percentage points more non-routine tasks compared to local firms.

Figure 1 and Table 1 showed that non-routine tasks constitute about 44 percent of total tasks. In this case, that non-routine tasks in foreign firms and in MNEs constitute a 2.4 - 4.3 percentage points higher share is relatively small but not negligible.

Estimations in columns three, four, nine, and ten use our second measure, the share of tasks requiring personal interaction. Foreign firms have more job tasks requiring personal interaction than domestic firms, and multinational firms have more than local firms. Firm differences in the share of tasks requiring personal interaction are smaller than those for non-routine tasks.

--Table 3 about here--

Finally, we compare our results for job tasks with a measure on education as dependent variable. As seen in columns five, six, eleven, and twelve, foreign and multinational firms have a higher share of employees with tertiary education in some but not all estimations. Hence, there is a correlation between higher education and non-routine/interactive job tasks, although the size of the coefficients indicates that measures of non-routine tasks identify larger differences between firms than the traditional measure on education.

*Examining the effect of ownership changes on job tasks*

Does an ownership switch from domestic to foreign or from domestic local to multinational affect the relative demand for tasks? As discussed in Section II, the change from domestic to multinational may affect the demand for tasks because of increased specialization, restructuring, and offshoring. We would then expect the relative demand for tasks that are not easily offshored—non-routine tasks and tasks requiring personal interaction—to increase after acquisition. We would also expect to see small changes, if any, in the demand for tasks after foreign acquisitions of domestic MNEs, since ownership is only being switched from one type of MNE to another.

The results in Table 4 show that when ownership changes from local Swedish to MNE (domestic or foreign), the demand for non-routine tasks increases. The magnitude is rather small; demand for non-routine tasks increases about 1 percentage point (see column one). A switch from local to foreign ownership or from domestic MNE to foreign ownership has no effect. The results for tasks requiring personal

interaction and education are all statistically insignificant with respect to ownership changes.

--Table 4 about here--

--Table 5 about here--

As discussed in Section III, the estimations in Table 4 suffer from a potential selection bias. In Table 5 we report the estimations on a propensity score matched sample of firms.<sup>16</sup> The results differ from the estimations in Table 4. A change in ownership from local to MNE increases the demand for non-routine tasks by 0.7 percentage points and for interactive tasks by 1.3 percentage points. The change from domestic local to foreign multinational has almost as large of an effect. As expected, the ownership change from domestic multinational to foreign multinational does not change the relative demand for tasks.

An important question becomes thus: does dividing labor according to job tasks contribute anything new to our understanding about the effects of FDI on labor demand? To examine this issue, we follow in line with the previous literature and define our dependent variable in terms of educational attainment. Results show that none of the ownership changes has a significant effect on the demand for education, as seen in columns seven to nine. This result suggests that changes in the relative demand for job tasks do indeed indicate a labor market aspect that an educational distinction fails to capture.<sup>17</sup>

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<sup>16</sup> Table A2 in the Appendix shows that the bias in the control variables is substantially reduced, although a statistical significant difference remains for some of the variables.

<sup>17</sup> Other measures on education also showed insignificant difference between different firms.

*Trying to explain the differences in job tasks*

The results above suggest that multinational firms have higher shares of non-routine tasks and that acquisitions of local firms by MNEs increase the demand for non-routine tasks and tasks requiring personal interaction. As discussed in Section II, the ability to engage in offshoring potentially explains this relative demand. To examine the hypothesis further, we include proxies of offshoring, defined as the share of imported intermediate goods in total sales. We also distinguish between offshoring to low- or high-income countries to examine the importance of wage-cost reducing offshoring.<sup>18</sup>

-- Table 6 about here--

Table 6 compares firms with different ownership. Columns 1-5 show differences between domestic and foreign firms and columns 6-10 compare domestic and multinational firms. As seen in columns one and six, the proxy of offshoring is related to job task composition. We would expect offshoring to increase rather than decrease the demand for non-routine tasks if offshoring is driven by lower labor costs. It is perhaps surprising then that the coefficient of the offshoring variable is negative, indicating that a higher share of imported intermediates in output implies a lower share of non-routine tasks. A one percentage point increase in offshoring reduces non-routine tasks by about 0.4 percentage points.

A closer look at the offshoring measure provides us with an explanation: most offshoring is to other high-income countries. We therefore divide our estimations between high- and low-income countries. The results in columns two and seven show

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<sup>18</sup> High-income countries are OECD countries and low-income countries are non-OECD countries.

that offshoring to high-income countries reduces the demand for non-routine tasks, whereas offshoring to low-income countries has no statistically significant effect. Hence, imports of intermediate goods from other high-income countries appear to substitute for more advanced job tasks.

Even after controlling for offshoring, foreign firms have a higher share of non-routine tasks than domestic firms, and MNEs a higher share than non-MNEs. The estimated effects are smaller than indicated by Table 3, but only marginally so. This indicates that the effect of offshoring is similar across ownership groups, which is confirmed by the statistically insignificant interaction variables between foreign or multinational ownership and offshoring (columns three and eight).

Another plausible explanation for the results is that ownership is associated with firm size and that firm size impacts the demand for tasks. Large firms might, for instance, have a different production and labor force structure, and thereby a different demand for tasks. We therefore include a conventional variable of firm size, measured as the number of employees. Other firm characteristics that affect labor demand may exist that are not controlled for in the previous estimations. In additional estimations, we include a whole set of firm characteristics, including firm size, share of employees with lower secondary education, share of employees with tertiary education, firm age, sales per employee, profits per employee, share of women, share of blue-collar workers, and share of exports in sales.

As seen in Table 6, results do not change qualitatively: foreign firms and MNEs have a higher share of non-routine tasks after controlling for firm size and other characteristics. Note that large firms have less non-routine tasks, which may be explained by economies of scale in overhead functions.

In columns one, five, and nine in Table 7, we investigate the impact of offshoring in acquisition estimations. The offshoring variable is not statistically significant but the estimated coefficient for the acquisition variable changes. The ownership switch from local to multinational still increases the demand for non-routine job tasks, but at a reduced rate. The ownership change from domestic to foreign does not increase the demand for non-routine tasks when offshoring is included. The change is caused by a different (reduced) sample of firms rather than by the inclusion of offshoring; when we repeat the estimations for the reduced sample without the offshoring variable, the coefficients of ownership variables are identical to the ones in columns one, five, and nine (not shown). We conclude thus that differences in offshoring between different firms cannot explain the effects of acquisitions on job tasks.

-- Table 7 about here--

Using our measure of tasks requiring personal interaction as a dependent variable generates the same results as in Tables 6 and 7: offshoring has a negative effect on the share of interactive tasks, but no major impact on the coefficients for foreign and multinational ownership (not shown).

The results for acquisitions in Table 7 are in line with our previous findings when we include firm size, but the effect is slightly reduced when we include other firm characteristics. We have also included additional firm-level variables in estimations where the cost share of tasks requiring personal interaction is the dependent variable. Coefficients on all acquisitions were positive and statistically significant when firm size was included (not shown). We conclude that firm size and

other firm characteristics have an effect on task composition but that a difference between ownership types still remains, even after controlling for these characteristics.

When speaking of firm size, we have estimated our regressions on firms with at least 20 employees. To take into account that individuals in smaller firms are sampled, we only examine the effect of ownership and tasks in large firms. The results based on firms with at least 50 employees remained very similar to results of the total sample of firms (not shown).

Finally, we show in columns four, eight, and twelve in Table 7 how the effect of acquisitions on job tasks evolves over time. The effect of an ownership change from Swedish local firm to multinational is rather immediate, occurring during the same year as the acquisition or within the next year. This result suggests that possible adjustment costs involved do not prolong the change in the composition of job tasks, and that the acquisitions trigger MNEs to institute organizational changes that can be quickly realized.

#### *Additional estimations*

We have seen that multinational firms have a higher relative demand for non-routine and interactive job tasks than non-multinational firms. The higher demand can be reflected in wage cost shares both as a larger number of employees and as higher wages. Previous literature has argued that the more rigid the labor market, the more likely that an increased relative labor demand would appear in employment shares rather than wages (e.g., Machin and Van Reenen, 1998; Anderton and Brenton, 1999; Strauss-Kahn, 2003; Hijzen et al. 2005). To gain further insights, we run regressions using employment shares instead of labor cost shares as a dependent variable (Table

8). The estimated effect shows the impact of ownership on factor demand net of wage effects.

--Table 8 about here--

As seen in columns 1 and 2, foreign and multinational firms still have higher shares of non-routine job tasks. The coefficients are marginally smaller than in Table 3, suggesting that higher wages in MNEs explain part of the difference. More interestingly, columns 3 to 5 show that changes in ownership do not affect employment shares of routine and non-routine tasks. Hence, the results suggest that an important part of changes in relative labor demand are reflected in wages. Heyman et al. (2006 and 2007) find that acquisitions increase wages and also wage dispersion, primarily by increasing wages for CEOs and other managers.<sup>19</sup> These occupations are typically characterized by non-routine and interactive job tasks; therefore, these studies seem to correspond to our findings on changes in relative labor demand.

But are our results also valid for alternative measures of job tasks? To examine this issue, we first use a more conservative dependent variable in which fewer tasks are regarded as non-routine and interactive (Becker et al., 2007). The results remained largely unchanged when we used non-routine tasks as dependent variable, although the estimated coefficients declined marginally. For instance, the coefficient for foreign ownership declined from 2.4 (Table 3) to 2.1, and the coefficient for MNE ownership from 2.6 to 2.3.

The results for personal interaction changed: the coefficients were not statistically significant in the estimations comparing foreign and domestic firms and

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<sup>19</sup> See also Girma and Görg (2007) and Huttunen (2007) for other studies on acquisitions and wages.



multinational and local firms (not shown). The coefficients for MNE and foreign ownership in the acquisition estimations remained statistically significant, but at a lower significance level.

Second, we use definitions of job tasks based on Spitz-Oener's (2006) study of technological change, job tasks, and rising educational demand. Spitz-Oener's definitions stem from the same German survey as we use for our main tasks measures, although she uses a different classification of job tasks.<sup>20</sup> In columns 6 to 10 in Table 8, we present results for estimations using a measure of non-routine tasks based on Spitz-Oener's definitions. Foreign and multinational firms have more non-routine job tasks, but shares are lower than for our main measure of non-routine job tasks. Similarly, ownership changes from domestic to foreign or multinational have a positive but relatively small effect on non-routine job tasks as seen in columns eight and nine. As expected, ownership switches from domestic MNEs to foreign MNEs have no effect on demand for non-routine tasks. To sum up, our main results are robust when considering alternative definitions of job tasks, though the size of the ownership effect differs slightly.

Finally, we have tried alternative specifications of the set of independent variables. Unlike our study, most previous studies do not include a variable for technology. Our variable on ICT is a sector level variable and therefore implicitly assumes that technologies are similar across firms and within sectors. Dropping our variable on ICT intensity did not impact the results. Moreover, we also used firm-level R&D expenditures as an alternative technology variable, but, again, it had no major impact on the results.<sup>21</sup> Following previous studies, we excluded the relative wage from the main estimations because of the obvious risk of an endogeneity

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<sup>20</sup> We thank Alexandra Spitz-Oener for sharing her definitions with us.

<sup>21</sup> R&D is not available for all firms below 50 employees and is not available for the years 2003-2005 which is why it is not included in the default specification.

problem. Including the relative wage increases the coefficients on the ownership variables slightly but has no qualitative effect on the results (not shown). The relative wage variable is negative, as expected.

## **VI. Concluding Remarks**

FDI has increased rapidly over the last decades. Many assume that this development will decrease demand for unskilled employees and increase demand for skilled employees in developed countries. However, empirical studies find small effects of FDI on relative labor demand. Indeed, the distinction between high- and low-skilled employees may not be the most relevant.

In line with recent literature on offshoring and international trade, we examine the effect of inward FDI on the demand for labor and define the division of labor in terms of job tasks. We begin by examining the differences in job task composition between foreign and local Swedish firms and between multinational and local Swedish firms. We proceed with the effect of ownership changes, from local to MNEs and from domestic, local or multinational, to foreign.

Multinational firms, both foreign and domestic, have higher shares of non-routine tasks and tasks requiring personal interaction than local firms. For instance, the share of non-routine tasks is between 2.6 and 4.3 percentage points higher in MNEs than in local Swedish firms, compared to the aggregate share of non-routine tasks of about 44 percent in the Swedish industry. Acquisitions of local firms by both foreign and domestic MNEs tend to increase the relative demand for non-routine and interactive job tasks. The effect of an acquisition is rather immediate: the largest change mainly occurs during the same year as the acquisition or within the next year.

As expected from the theory on multinational firms, acquisitions of Swedish MNEs by foreign MNEs have no effect on labor demand.

Although the difference in job tasks declines when we control for various firm characteristics such as offshoring, it does not disappear. Future research can thus try to explain the difference in demand for tasks.

In line with previous studies, we define our dependent variable in terms of educational attainment. We find classifying labor force according to educational skills does not capture the effects found by using job tasks measures.

To sum up, FDI in a developed country such as Sweden decreases relative demand for routine and non-interactive job tasks—those that do not require proximity to other production activities and can be easily offshored. By shifting focus from the comparative advantages measured in terms of skills to the content of job tasks, we contribute with new knowledge of the effects of increased inward FDI on domestic employment.

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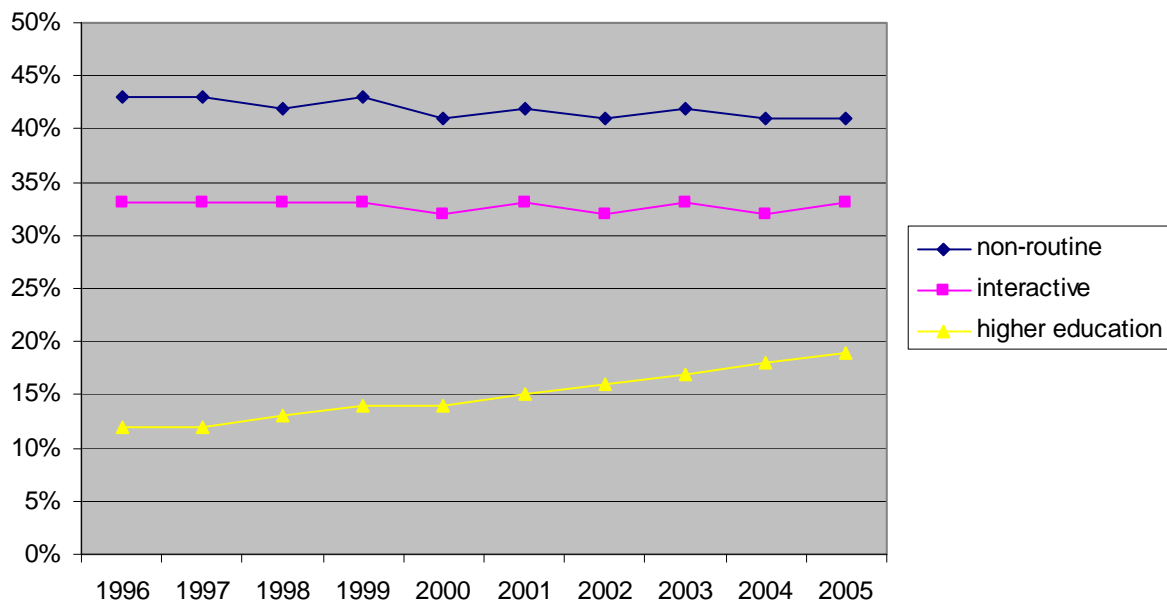
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**Table 1.** The shares of non-routine and interactive tasks in different occupations (%).

	Non-routine	Interactive
Physical, mathematical and engineering science professionals	100.0	65.9
Life science and health professionals	90.4	57.9
Physical and engineering science associate professionals	79.7	48.0
Corporate managers	78.4	61.0
Other professionals	63.0	49.3
Teaching professionals	61.2	65.7
Life science and health associate professionals	56.3	32.3
Legislators and senior officials	54.4	38.4
Other associate professionals	52.7	33.4
Office clerks	52.1	26.4
General managers	46.6	46.5
Stationary-plant and related operators	43.6	39.7
Metal, machinery and related trades workers	41.6	44.3
Precision, handicraft, printing and related trades workers	39.8	14.7
Teaching associate professionals	36.1	61.6
Personal and protective services workers	32.0	26.5
Customer services clerks	27.1	15.8
Extraction and building trades workers	21.4	34.6
Machine operators and assemblers	18.8	10.8
Other craft and related trades workers	17.7	14.7
Market-oriented skilled agricultural and fishery workers	10.8	23.8
Models, salespersons and demonstrators	8.1	15.1
Drivers and mobile-plant operators	6.3	30.3
Laborers in mining, construction, manufacturing and transport	2.5	12.4
Agricultural, fishery and related laborers	0.9	10.1
Sales and services elementary occupations	0.0	0.0

**Figure 1. The shares of non-routine tasks, interactive tasks, and workers with higher education.**



**Table 2. Ownership, offshoring and job tasks.**

	Share in total number of firms	Share of imported intermediates in output	Non-routine	Personal interaction	Higher education
All firms		0.06 (0.12)	0.44 (0.20)	0.34 (0.12)	0.20 (0.20)
Swedish local firms	0.66	0.04 (0.10)	0.41 (0.20)	0.34 (0.12)	0.20 (0.21)
Swedish multinational firms	0.12	0.07 (0.11)	0.48 (0.18)	0.35 (0.12)	0.20 (0.19)
Foreign firms	0.22	0.10 (0.16)	0.49 (0.18)	0.36 (0.11)	0.20 (0.17)

Note: Higher education is employees with tertiary education. Non-routine tasks, personal interaction, and higher education are all defined as cost (wage) shares. Standard deviations are shown within brackets.



**Table 3.** The effect of ownership on the demand for job tasks and educational skills. Firm-level estimates 1996-2005.

	1	2	3	4	5	6	7	8	9	10	11	12
	Foreign Firms						Multinational Firms					
	Non-routine Tasks		Interactive Tasks		Educational Skills		Non-routine Tasks		Interactive Tasks		Educational Skills	
Ownership dummy	0.037 (0.004)***	0.024 (0.004)***	0.014 (0.003)***	0.008 (0.003)***	0.013 (0.004)***	0.003 (0.004)	0.043 (0.003)***	0.026 (0.004)***	0.017 (0.002)***	0.008 (0.002)***	0.026 (0.004)***	0.011 (0.004)***
Capital	--	-0.009 (0.001)***	--	-0.003 (0.001)***	--	-0.009 (0.001)***	--	-0.009 (0.001)***	--	-0.003 (0.001)***	--	-0.008 (0.001)***
Value added	--	0.017 (0.001)***	--	0.008 (0.001)***	--	0.017 (0.002)***	--	0.015 (0.001)***	--	0.008 (0.001)***	--	0.015 (0.002)***
ICT	--	0.019 (0.007)***	--	0.008 (0.005)	--	0.005 (0.007)	--	0.019 (0.007)***	--	0.008 (0.005)	--	0.005 (0.007)
Year dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
R <sup>2</sup> adj.	0.52	0.54	0.45	0.46	0.49	0.50	0.52	0.54	0.45	0.46	0.49	0.51
No. of observations	28,567	27,746	28,567	27,746	25,788	25,008	28,567	27,746	28,567	27,746	25,788	25,008

Notes: The dependent variable is the wage cost share of the educational skill, non-routine tasks or interactive tasks of employees. Robust standard errors, adjusted for clustering at the firm level within parentheses.\*\*\* indicate significance at the 1 %-level, \*\* significance at the 5 %-level and \* significance at the 10 %-level.

**Table 4.** The effect of ownership changes on the demand for non-routine and interactive job tasks. Firm-level estimates 1996-2005.

	1	2	3	4	5	6	7	8	9
	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign
	Non-routine			Interactive			Educational skills		
Acquisition	0.008 (0.004)*	0.008 (0.005)	0.008 (0.007)	0.004 (0.003)	0.005 (0.004)	0.006 (0.005)	0.003 (0.003)	0.008 (0.005)	0.001 (0.005)
Capital	-0.002 (0.002)	-0.002 (0.002)	0.006 (0.005)	-0.001 (0.001)	-0.002 (0.001)	-0.003 (0.003)	-0.002 (0.002)	-0.002 (0.002)	-0.003 (0.004)
Value added	-0.011 (0.003)***	-0.012 (0.003)***	0.016 (0.006)**	-0.007 (0.002)***	-0.007 (0.002)***	-0.007 (0.005)	-0.008 (0.003)***	-0.012 (0.003)***	-0.010 (0.005)**
ICT	-0.008 (0.009)	0.008 (0.010)	0.000 (0.016)	-0.005 (0.007)	-0.006 (0.008)	0.001 (0.010)	-0.001 (0.010)	0.008 (0.010)	0.023 (0.010)**
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup> (within)	0.01	0.01	0.03	0.01	0.01	0.02	0.13	0.01	0.22
No. of observations	17,268	16,534	2,232	17,268	16,534	2,232	14,747	16,534	2,210

Notes: The dependent variable in columns 1-3 is the wage cost share for employees with non-routine tasks, in columns 4-6 the wage cost share for employees with interactive tasks and in columns 7-9 is the wage cost share for employees with tertiary education. Acquisition takes the value of one in the acquisition period and thereafter, zero before. Robust standard errors, adjusted for clustering at the firm level within parentheses. \*\*\* indicate significance at the 1 %-level, \*\* significance at the 5 %-level and \* significance at the 10 %-level.

**Table 5.** The effect of ownership changes on the demand for non-routine and interactive job tasks. Firm-level estimates 1996-2005 on a propensity score matched sample of firms.

	1	2	3	4	5	6	7	8	9
	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign
	Non-routine			Interactive			Educational Skills		
Acquisition	0.007 (0.003)**	0.006 (0.004)*	0.005 (0.005)	0.013 (0.004)***	0.010 (0.005)**	0.007 (0.007)	0.003 (0.003)	0.000 (0.004)	0.000 (0.006)
Capital	-0.004 (0.002)	-0.000 (0.002)	-0.003 (0.004)	-0.005 (0.004)	-0.002 (0.003)	-0.003 (0.007)	-0.006 (0.003)*	-0.001 (0.002)	0.001 (0.006)
Value added	-0.005 (0.003)*	-0.003 (0.003)	-0.009 (0.005)*	-0.008 (0.005)	-0.005 (0.005)	-0.018 (0.007)**	-0.004 (0.004)	-0.001 (0.004)	-0.008 (0.005)
ICT	0.011 (0.012)	0.015 (0.014)	-0.002 (0.009)	0.021 (0.012)*	0.019 (0.018)	0.007 (0.014)	-0.009 (0.011)	0.011 (0.014)	0.022 (0.011)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup> (within)	0.02	0.01	0.02	0.02	0.01	0.03	0.18	0.18	0.20
No. of observations	3,778	2,566	1,492	3,778	2,566	1,492	3,502	2,352	1,474

Notes: The dependent variable in columns 1-3 is the wage cost share for employees with non-routine tasks, in columns 4-6 the wage cost share for employees with interactive tasks and in columns 7-9 is the wage cost share for employees with tertiary education. Acquisition takes the value of one in the acquisition period and thereafter, zero before. Robust standard errors, adjusted for clustering at the firm level within parentheses. \*\*\* indicate significance at the 1 %-level, \*\* significance at the 5 %-level and \* significance at the 10 %-level.

**Table 6.** The effect of ownership on the demand for non-routine job tasks controlling for additional firm characteristics 1996-2005.

	1	2	3	4	5	6	7	8	9	10
	Foreign Firms					Multinational Firms				
Ownership dummy	0.019 (0.004)***	0.019 (0.004)***	0.017 (0.005)***	0.025 (0.004)***	0.008 (0.002)***	0.023 (0.004)***	0.023 (0.004)***	0.023 (0.004)***	0.027 (0.003)***	0.008 (0.002)***
Offshoring	-0.043 (0.015)***	--	-0.058 (0.020)***	--	--	-0.046 (0.015)***	--	-0.052 (0.023)**	--	--
Offshoring high-income countries	--	-0.045 (0.016)***	--	--	--	--	-0.047 (0.016)***	--	--	--
Offshoring low-income countries	--	-0.012 (0.058)	--	--	--	--	-0.021 (0.057)	--	--	--
Offshoring * Foreign firms	--	--	0.027 (0.026)	--	--	--	--	0.008 (0.026)	--	--
Offshoring * Multinational	--	--	--	--	--	--	--	--	--	--
Log Firm size	--	--	--	-0.064 (0.004)***	--	--	--	--	-0.064 (0.004)***	--
Additional firm characteristics	No	No	No	No	Yes	No	No	No	No	Yes
Firm controls	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Industry dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
R <sup>2</sup> adj.	0.55	0.55	0.55	0.56	0.79	0.55	0.55	0.55	0.56	0.79
No. of observations	16,997	16,997	16,997	27,746	27,160	16,997	16,997	16,997	27,746	27,160

Notes: The dependent variable is the wage cost share for employees with non-routine tasks. Offshoring is a firm-level variable defined as the share of imported intermediate goods in total sales. High income countries are OECD countries. Low income countries are non-OECD countries. Firm controls are log capital intensity, log value added and ICT. Additional firm characteristics include log firm size, share of high-skilled employees, share of low-skilled employees, firm age, sales per employee, profits per employee, share of women, share of blue-collar workers and export per sales. Robust standard errors, adjusted for clustering at the firm level within parentheses.\*\*\* indicate significance at the 1 %-level, \*\* significance at the 5 %-level and \* significance at the 10 %-level.

**Table 7.** The effect of ownership changes on the demand for non-routine job tasks controlling for additional firm characteristics.

	1	2	3	4	5	6	7	8	9	10	11	12
	From Swedish local to MNE				From Swedish local to foreign				From Swedish MNE to foreign			
Acquisition	0.011 (0.005)**	0.014 (0.005)***	0.010 (0.004)**		0.007 (0.005)	0.010 (0.005)**	0.008 (0.004)*		0.007 (0.007)	0.008 (0.007)	0.004 (0.006)	
Acquisition (t=0)				0.009 (0.004)**				0.006 (0.004)				0.009 (0.006)
Acquisition (t+1)				0.012 (0.005)**				0.006 (0.005)				0.005 (0.007)
Acquisition (t+2)				0.008 (0.006)				0.004 (0.008)				0.008 (0.007)
Offshoring	0.023 (0.041)				-0.023 (0.057)				-0.031 (0.048)			
Log Firm size		-0.027 (0.009)***				-0.022 (0.011)**	--			-0.039 (0.017)**	--	
Additional firm characteristics		No	Yes			No	Yes			No	Yes	
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.02	0.02	0.29	0.02	0.02	0.02	0.17	0.01	0.03	0.04	0.38	0.03
No. of observations	2,454	3,778	3,769	3,778	1,722	2,566	2,564	2,566	1,351	1,492	1,490	1,492

Notes: The dependent variable is the wage cost share for employees with non-routine tasks. Acquisition takes the value of one in the acquisition period and thereafter, zero before. Acquisition t=0 takes the value one in the acquisition period acquisition and zero otherwise. The other Acquisition ((t+1) and (t+2)) variables are defined accordingly. Offshoring is a firm-level variable defined as the share of imported intermediate goods in total sales. Firm controls are the same as in Tables 4 and 5. Additional firm characteristics include log firm size, share of high-skilled employees, share of low-skilled employees, firm age, sales per employee, profits per employee, share of women, share of blue-collar workers and export per sales. Robust standard errors, adjusted for clustering at the firm level within parentheses. \*\*\* indicate significance at the 1 %-level, \*\* significance at the 5 %-level and \* significance at the 10 %-level.

**Table 8.** The effect of ownership changes on the demand for non-routine job tasks. Alternative dependent variables.

	1	2	3	4	5	6	7	8	9	10
	Foreign firms vs. Domestic firms	MNEs vs. Swedish local firms	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign	Foreign firms vs. Domestic firms	MNEs vs. Swedish local firms	From Swedish local to MNE	From Swedish local to foreign	From Swedish MNE to foreign
	Non-routine employment shares					Spitz-Oener				
Foreign Firms	0.021 (0.004)***	--	--			0.005* (0.003)	--	--		
Multinational	--	0.023 (0.004)***	--	--	--	--	0.005 (0.003)**	--	--	--
Acquisition	--	--	0.005 (0.005)	0.006 (0.005)	0.007 (0.006)	--	--	0.009 (0.004)**	0.009 (0.004)**	0.005 (0.008)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	No	No	No	Yes	Yes	No	No	No
Firm fixed effects	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
R2	0.56	0.56	0.01	0.01	0.01	0.58	0.58	0.02	0.02	0.03
No. of obs.	27,746	27,746	3,778	2,566	1,492	27,746	27,746	3,778	2,566	1,492

Notes: The dependent variable in columns 1-5 is the share of employees with non-routine job tasks. The dependent variable in columns 6-10 is the wage cost share for employees with non-routine tasks according to Spitz-Oener's definitions. Acquisition takes the value of one in the acquisition period and thereafter, zero before. The acquisition estimations in columns 3-5 and 8-10 are based on the propensity score matched sample. Robust standard errors, adjusted for clustering at the firm level within parentheses. \*\*\* indicate significance at the 1 %-level, \*\* significance at the 5 %-level and \* significance at the 10 %-level.

## Appendix

**Table A1.** Definitions and descriptive statistics (means and standard deviations). Firms with at least 20 employees, 1996-2005.

Firm variables		All firms	Swedish local firms	MNEs	Foreign firms
Wage cost share, non-routine tasks	Wage cost share, for non-routine tasks	0.44 (0.20)	0.41 (0.20)	0.49 (0.18)	0.49 (0.18)
Wage cost share, personal interaction	Wage cost share for personal interaction tasks	0.34 (0.12)	0.34 (0.12)	0.35 (0.11)	0.36 (0.11)
Wage cost share, tertiary education	Wage cost share, employees with tertiary education.	0.20 (0.20)	0.20 (0.21)	0.20 (0.18)	0.20 (0.17)
Capital/sales	(Net property, plant and equipment)/ sales.	0.00042 (.0023)	0.0005 (0. 0028)	.0002 (0.001)	0.0002 (.001)
Value added	Sales-operational expenses excluding wages.	216,580 (978,706)	121,722 (618,312)	399,507 (1,420,256)	299,990 (997,740)
ICT	Capital compensation for computing and communications equipment as a share of total capital compensation	0.226 (0.186)	0.219 (0.183)	0.240 (0.191)	0.237 (0.181)
Offshoring	Share of imported intermediate goods in total sales	0.064 (0.123)	0.041 (0.112)	0.089 (0.142)	0.097 (0.156)
Offshoring, high income countries	Share of imported intermediate goods in total sales to OECD countries	0.059 (0.116)	0.037 (0.090)	0.082 (0.134)	0.092 (0.149)
Offshoring, low income countries	Share of imported intermediate goods in total sales to non-OECD countries	0.005 (0.027)	0.004 (0.025)	0.006 (0.028)	0.006 (0.027)

Note: All monetary variables are in 1995 SEK. The task shares are constructed as a share of non-routine (or interactive) job tasks in the total job tasks of an employee with a certain occupation. The firm-level wages cost shares are the sum of the task shares multiplied with the wage costs of the employees in total wages costs.

**Table A2.** Control variables in matched and unmatched samples of firms.

	Variable	Sample	Mean		% bias	% reduction in bias	t-statistics
			Treated	Control			
From Swedish local to MNE <sup>1</sup>	Capital/sales	Unmatched	-9.414	-8.915	-29.6		5.43***
		Matched	-9.414	-9.194	-13.1	55.9	1.92*
	Value added	Unmatched	11.168	10.525	49.5		9.73***
		Matched	11.168	10.589	44.6	9.9	6.06***
	R&D sales	Unmatched	0.005	0.010	-4.8		0.69
		Matched	0.005	0.005	0.5	89.9	0.18
From Swedish local to foreign <sup>2</sup>	Capital/sales	Unmatched	-9.462	-8.920	-31.6		4.63***
		Matched	-9.462	-9.234	-13.3	58.0	1.54
	Value added	Unmatched	11.244	10.518	54.7		8.65***
		Matched	11.244	10.763	36.2	33.8	3.51***
	R&D sales	Unmatched	0.005	0.009	-5.2		0.58
		Matched	0.005	0.004	1.6	69.5	0.62
From Swedish MNE to foreign <sup>3</sup>	Capital/sales	Unmatched	-9.146	-9.009	-10.1		1.22
		Matched	-9.154	-9.161	0.5	94.6	0.04
	Value added	Unmatched	11.744	12.412	-47.3		5.26***
		Matched	11.744	12.297	-39.2	17.2	3.27***
	R&D sales	Unmatched	0.036	0.028	7.1		1.03
		Matched	0.028	0.027	0.9	86.7	0.09

Note: \*\*\* indicate significance at the 1 %-level, \*\* significance at the 5 %-level and \* significance at the 10 %-level. The matching variables are chosen to satisfy the balancing property of the propensity score and therefore differ between the three sub-samples. 1) The lag variables used for the matching are value added per employee with one and two lags, firm age, export share, (export share)<sup>2</sup>, R&D intensity, (R&D intensity)<sup>2</sup>, capital/sales, share of tertiary educated and mean level of labor market experience at the firm level. 2) The variables used for the matching are value added per employee with one, two and three lags, firm age, capital/sales, share of employees with upper secondary education, R&D intensity and mean level of labor market experience at the firm level. 3) The variables used for the matching are value added per employee with one and two lags, firm age, export share, (export share)<sup>2</sup>, R&D intensity, capital/sales, (capital/sales)<sup>2</sup>, share of tertiary educated and labor market experience at the firm level.